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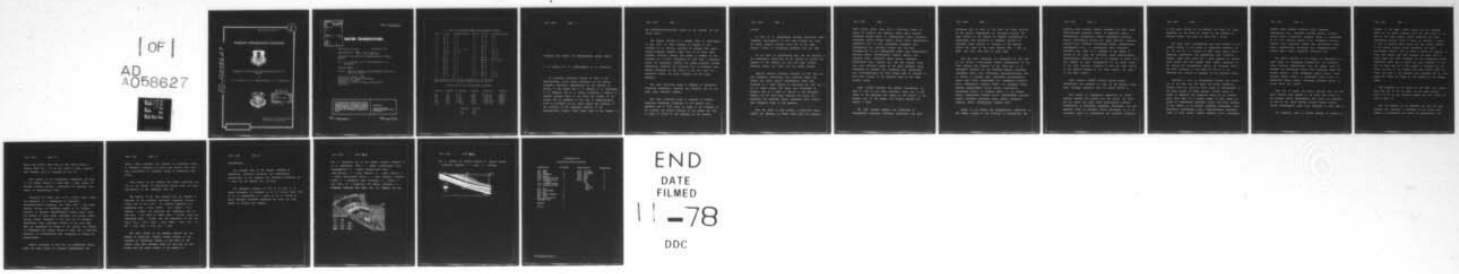

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"JUBILEE" COAL DEPOSIT IN SEMIPALATINSKIY IRTYSH REGION

by

S. S. Kuz'min, Ye. I. Murakhovskaya, A. A. Sukhorukov

EDITED TRANSLATION

FTD-ID(RS)T-2357-77 8 February 1978

MICROFICHE NR: FTD-78-C-000216

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English pages: 14

Source: Vestnik Akademii Nauk Kazakhskoy SSR, Nr 8, 1970, pp. 67-70.

Country of origin: USSR
Translated by: Marilyn Olaechea
Requester: FTD/ETDP
Approved for public release; distribution unlimited.

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А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

"JUBILEE" COAL DEPOSIT IN SEMIPALATINSKIY IRTYSH REGION

S. S. Kuz'min, Ye. I. Murakhovskaya, A. A. Sukhorukov

In conducting geological studies in 1967 in the Semipalatinskiy Irtysh region geologists of the Eastern Kazakhstan Geological Administration of the Ministry of Geology of the Kazakh SSR S. S. Kuz'min, A. A. Sukhorukov, K. S. Akhmetov, and N. I. Vlasov, discovered a deposit of semihard Jurassic coal. It was named the Jubilee. It is located 108 km southwest of the town of Semipalatinskiy, 10-15 km northwest of the rivers Chagan and Ashchisu, in the territory of the Abayevskiy district of the Semipalatinskiy oblast'. Sixty miles north of the deposit is

the Semipalatinsk-Konechnaya branch of the railroad and the Irtysh river.

The deposit consists of a graben, which is wedge-shaped in plan (Fig. 1). This structure is bounded on the southwest by an overlap, confirmed by borehole 12P, which revealed mesozoic deposits under rock of an early upper paleozoic intrusive complex. The graben is bounded on the northeast by a fault, established by data from a geological survey and geophysical studies. The graben structure includes sedimentary, effusive, and intrusive rock of different ages, sharply delineated by the nature of the fold into two structural stages: the lower paleozoic and the upper mesozoic.

The lower structural stage is composed of intensively dislocated sedimentary, effusive, and intrusive rock of the early upper paleozoic complex.

The upper structural stage is composed of slightly dislocated sedimentary formations of the mesozoic era, deposited with a 5-15° angle of slope to the southwest in the northern and central portions of the graben and with an angle of 10-25° to the northeast in the southern

portion.

In 1969 Ye. I. Murakhovskaya obtained pollen-like spore complexes, characteristic of the upper Triassic and lower and middle Jurassic periods, from rock of the upper complex, sampled in prospecting boreholes 2431 and 2482.

On the basis of palynological data and the features of the lithological composition of the strata, we divided the deposits of the mesozoic era into the upper Triassic (Rhaetian stage), the lower, and the middle Jurassic.

Rhaetian deposits consisted basically of dark gray and gray sandstone, aleurolites, thin gritstone layers and lenses, and finely pebbled conglomerates. These also consisted of a small portion of argillites and thin (up to 0.4 m) carbon lenses. The latter were established by borehole 2482 at a depth of 146-150 m. The enveloping material of the rock which comprised the strata was polymictic and clay-like cement. Carbonized plant fossils were frequently found in the deposits.

From the rocks of this stratum a pollen-like spore complex was obtained, in which, along with the typically

lower Liassic forms, there were a significant number of spores of marattian and osmundian ferns. These included Danaeopsis fecunda Halle, D. angustipinnata Brick, Bernoullia aktjubensis Brick, Todites szeiana (P'an) Brick, Hissaropteris jagnobensis Kuz. et Sixt. Encountered everywhere were Hymenophyllum sp., Patellina plicata Mal. The main representative of the gymnospermous plants were Paleoconiferus asaccatus Bolch., Protoconiferus funarius (Bolch.) var. triassica Fadd., Protopicea cerina Bolch., Podocarpus dacrydioides Rech., Caytonia sp., and many ginkoes. There were also individual relics of the upper paleozoic flora, represented by Lebachia sp., Cordaitina sp., Striatopinus sp., Striatopodocarpus sp. This complex made it possible to place this stratum in the Rhaetian stage of the upper Triassic period.

Upper Triassic deposits with angular nonconformity are found in rock of the lower structural stage, and at the limits of the described area emerge on the surface in the northern part of the graben. The Triassic deposits are 100-200 m thick.

The lower Jurassic deposits are represented by conglomerates, gritstone, sandstone, aleurolites, and thick

contiguous beds of coal. In the lower and middle portions of the section conglomerates and gritstones prevail. The upper portion of the section is composed predominately of aleurolites, less frequently of sandstone enriched by carbonized plant fossils. In contrast to the Rhaetian period, the rocks of the lower Jurassic have a gray or light gray color with blue or green hues.

From the coal, sandstone, and aleurolites of this part of the section a spore-pollen complex characteristic of the lower Jurassic was isolated. In the lower part it is represented primarily by the following species: Lycopodium suluctensis (Nik.) Kuz., Selaginella sanguinolentiformis Sach. et Iljina, S. turgaica Rom., Angiopteris parvispinullatus (Mal.) emend Fadd., Marattiopsis sp., Osmundopsis angrenica Sixt., Cheiropleuria compacta Bolch., Ch. congregata Bolch., Onychium amplectiformis (K.-M.) Bolch., Leictriletes bujargiensis Bolch., L. incertus Bolch., L. cf. eximius Bolch., Lophotrietes affluens Bolch., Paleoconiferus asaccatus Bolch., Paleopinus pectinella (Mal.) Bolch., Paleopicea glaesaria Bolch., Psophosphaera fissilis Fadd.

Higher in the section the sporophyte-dust composition of the complex changes in the direction of rejuvenation. The

typically lower Liassian species disappear and there appear Marattisporites scabratus Couper, M. muensterii Goepp., Matonisporites phlebopteris Couper, Phlebopteris exornatus Bolch., Clathropteris obovata var. magna Tur.-Ket., Cibotium junctum K.-M., Alsophila parvispinosa Bolch., Camptotriletes anagrammensis K.-M., C. cerebriformis Naum. Tripartina variabilis Mal. There is a decrease in the number of pollens of the ginko and coniferous groups Paleoconiferus, Protoconiferus, Paleopicea due to an increase in grains with well defined air sacs, characteristic of the higher stages of the lower Jurassic. According to this the lower portion of the deposits belongs to the lower Liassic, the upper - to the upper Liassic.

Lower Jurassic deposits without visible angular nonconformity are deposited in rocks of the Rhaetian stage. Their thickness apparently does not exceed 100-200 m.

With respect to lithological composition the middle Jurassic deposits are divided into two suites: the lower and the upper. The lower suite (coal-bearing) consists predominately of argillites, sandstone, aleurolites, and coal deposits. There is extremely limited development in it of lenticular layers of conglomerates and gritstone, extending

to the lower portion of the section. The upper and lower boundaries of the suite are marked by the presence of siderite lenses. The suite is about 300 m thick.

The upper suite (conglomerate) was only revealed in the central portion of the graben by prospecting boreholes 13, 14, 19, and 20. It consists of light gray, almost white, sandstone, aleurolites, and conglomerates with variegated pebbles, among which there was a great quantity of reddish brown granite and dark reddish brown jasper. Prevailing in the section are conglomerates (36%) and gritstone (9%). The total thickness of the suite is 200 m. It is deposited with erosion on deposits of the preceding suite.

According to data of palynological studies, the suites are of the same age. The spore and pollen composition obtained from the rocks of these suites is distinguished by the great variety of spore species. Percent ratios of spores of osmundian and dicksonian ferns can be isolated among them. There is a smaller number of moss spores and spores of undetermined systematic origin. The spore spectrum of the complex is as follows: Lycopodium subrotundum K.-M., Selaginella rotundiformis K.-M.., Selaginellidites spinulosus (Cook. et Dett) Krasn., Osmunda jurassica K.-M., Osmundopsis

rotunda Klim., Todites trivialis Klim., Aneimites kushmurunicus Rom., Gleichenia delicata Bolch., Dicksonia crocina Bolch., Coniopteris jurassica Bolch., C. onychioides Va et K.-M, Cibotium junctum K.-M., Onychiopsis elongata (Ceyler) Jok., Hausmannia leeiana Sze, Leictriletes varius Bolch., Camptotriletes triangulus Jar., Humenozonotriletes bicycla (Mal.) Sach., Tripartina variabilis Mal.

The pollen spectrum of the complex is represented by a large number of Cycadophyta, Bennettitale, and coniferous seeds. Pinaceae, Podocarpaceae. Here the ancient types of conifers are encountered rarely. More frequently these are younger species - Picea mesophytica (Pokr.) Bolch., Pinus insignus (Naum.) Bolch., P. Sacculifera (Mal.) K.-M., P. subconcinua (Naum.) Bolch., Podocarpus multicina Bolch., P. patula Bolch. and others.

This list of spores and pollen indicates that the rock which contains them belongs to the lower most strata of the Jurassic period (aalen-bayos). The latter are deposited in rock of the lower Jurassic stratum without visible angular nonconformity. Their total thickness is about 500 m.

The commercial tenor of Jubliee deposits is related to

deposits of the upper Liassic period and the lowermost strata of the middle Jurassic. The coal beds found in the rock of the upper Liassic period constitute the lower coal-bearing horizon, 85-90 m thick. It includes 5 strata of coal of working depth, while the coal strata confined to the middle Jurassic period constitute the upper coal-bearing horizon. This is 50-80 m thick. It consists of three coal strata. The coal horizons lie about 35-40 m apart. Thus, the total thickness of the coal-bearing horizon constitutes about 180 m, while the total thickness of the coal is more than 60 m. The angles of incidence of the strata on most of the deposit area vary within limits of 5-10°, and only in the Jurassic part (borehole 85) do they reach 25°, which is caused by the presence of an overlap there.

The thickness of the strata of the lower coal horizon vary from 3.4 to 8.7 m; those of the upper horizon - from 2 to 22 m. The distance between the coal strata is 2-20 m (Fig. 2).

For the deposit, as is generally the case for most Jurassic coal deposits, a breakdown of the strata with respect to inclination and strike is characteristic. We

might also mention that most of the strata retain a working depth for 7 km in the north to south direction from borehole 2482 to boreholes 85 and 13.

With respect to its petrographic composition the coal of the Jubliee deposit is humus with a small amount of sapropel material (0.2%). Occasionally we encounter thin layers of sapropel-humus coal.

Externally the humus coal is of a black color, glossy and semiglossy of a homogeneous or indefinite lenticular-striated structure, and light, with a very small quantity (0.1%) of fusainized matter. It is composed primarily of gelified ligno-cellulosic fibers, among which the residue of sheet (leaf) parenchyma and cortical fibers prevail. Lipoid components in the coal are of secondary significance. They constitute 10-40% of the coal mass. They are represented by breaks in the cuticle, the casings of microspores and pollen, grains of resin and a resin-like substance. In microstructure they correspond to clarain and durain-clarain.

Mineral inclusions in the coal are encountered rarely. These are small grains of syngenite sphercsiderite and

pyrite, widely dispersed clay material of terrigenous origin or epigenetic formations of pyrite and calcite. Coal with a high concentration of inorganic matter is encountered very rarely.

With respect to its physical and optical properties the coal of the deposit is transitional between brown and hard, corresponding to the commercial mark DE.

The quality of the coal averaged over the deposit is described by the following indicators: analytical moisture - 6.3%, ash in dry coal - 17, volatile substances per combustible mass - 47.4, sulfur - 0.3, carbon - 78.7, hydrogen - 5.3%; the caloricity per combustible mass is 7200 Ccal - the yield of humus acids - 2.62%, resin per combustible mass - 12.5%. The ash composition of the coal (%): SiO_2 - 43.2, Al_2O_3 - 28.9. Fe_2O_3 - 10.3, CaO - 5, MgO - 2.43, TiO_2 - 1.12, SO_3 - 4.55.

The water content of the mesozoic deposits was not studied in particular. However, during drilling of the boreholes no substantial changes in the level of the rinsing fluid were observed. Based on this fact we can assume that the water content of the deposit is

insignificant.

The stripped rock of the depcsit consisted of aleurolites, sandstone, gritstone, and conglomerates, characterized by low strength. The stripping coefficient as a whole for the deposit was 1:1-1:1.5.

The geological reserves of coal in an area of 22 square kilometers is estimated to be 1.5 billion tons. Most of it is concentrated at a depth of up to 100-150 m, which indicates favorable conditions for using the open method in working this deposit.

Fig. 1. Geological map of the Jubliee deposit. Composed by A. A. Sukhorukova, 1969. 1 - middle Jurassic-upper suite (conglomerate); 2 - middle Jurassic-lower suite (coal-bearing); 3 - lower Jurassic; 4 - upper Triassic; 5 - middle carbon-buchon suite; 6 - upper paleozoic intrusive comlex; 7 - porphyrite upper paleozoic; 8 - breaks; 9 - coal beds; 10 - prospecting and mapping boreholes; 11 - boreholes revealing coal beds. KEY: (1) Symbols, (2) km.

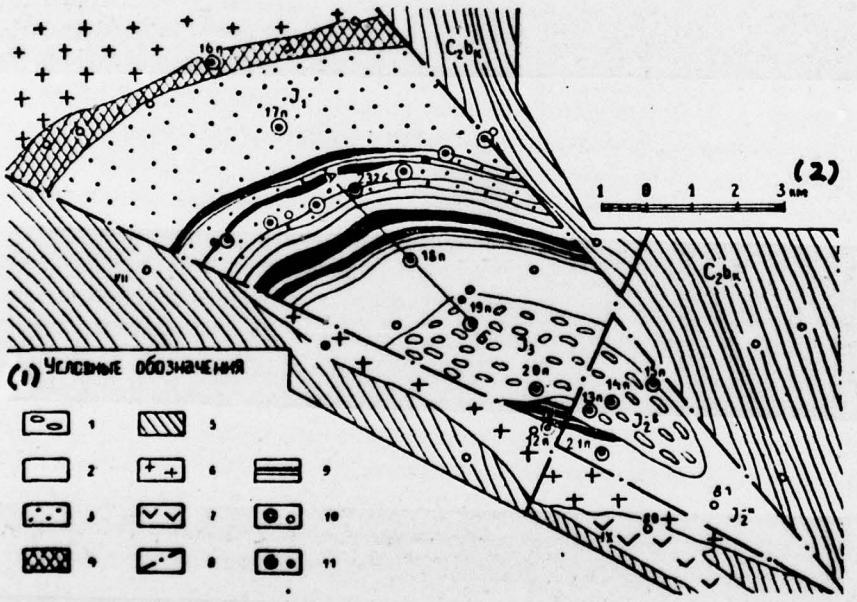
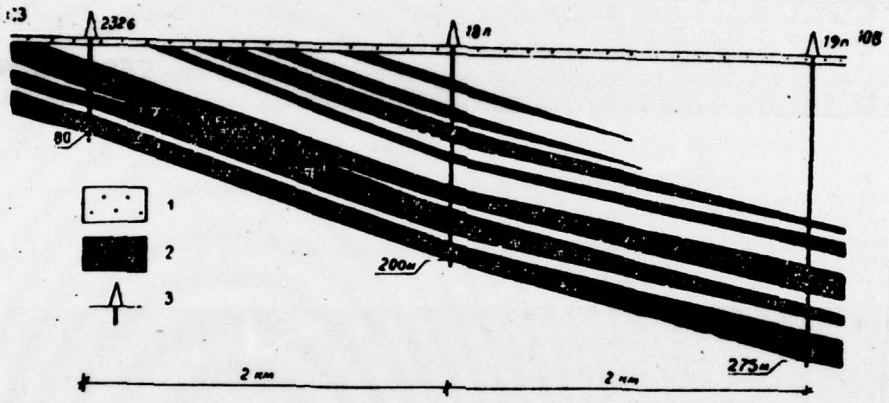


Fig. 2. Section of northern portion of Jubliee deposit. 1 - quaternary deposits; 2 - coal; 3 - borehole.



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